ARM RADAR SIMULATOR: A TOOL FOR COMPARISON OF MODELED AND OBSERVED CLOUDS AND PRECIPITATION AT THE ARM CLIMATE RESEARCH FACILITIES

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ABSTRACT

The Atmospheric Radiation Measurement (ARM) program has an excellent record in gathering data for the development and testing of models of atmospheric radiation transfer, cloud properties, and the full life cycle of clouds, with the ultimate goal of developing and validating new parameterizations for climate models. Toward this goal, we have developed a new tool, the ARM Radar Simulator (ARS), for direct comparison between modeled and observed clouds and precipitation at the ARM sites, using existing and future ARM radar systems. ARS takes its input from CRM and LES models of cloud properties and atmospheric state, which it converts to radar observables (e.g., reflectivity, Doppler spectra, polarimetric parameters). This approach circumvents uncertainties related to the retrieval process because the model can be described much more accurately than the inversion process, which always involves certain assumptions, and allows full exploitation of the information content of multi-parametric Doppler radar observations. We will present examples of LES and CRM outputs that were input to the ARS and comparisons between the modeled (synthetic) and observed radar observables that illustrate the potential of this tool. The ARS will eventually be provided to the modeling community to facilitate comparison between ARM radar observables and model outputs, and it may also function as an educational tool for both radar experts and modelers, allowing each group to become familiar with the issues faced by the other. In the future, the ARS module will be used in the development of a more general ARM simulator that will include lidar, radiometer and satellite measurements.